

WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY
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Note to Readers: Pages 1-13 comprise the summary and analysis of this report. Expanded details for some items that might not be available via the Internet at a later date are in the Appendix beginning on page 14.

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Item 1. Increasing Oil Demand in China and India Raise Security Concerns

The hunger for energy might become a driving force for some countries to disregard international security issues and accords to the point of jeopardizing international security. For example, there were international concerns expressed about the alleged Chinese offers of arms and other sensitive defense technology in return for oil and gas rights in certain countries. “Unprecedented political opposition” probably triggered by strategic concerns in the US Congress forced the withdrawal of China National Offshore Oil Corporation (CNOOC)'s bid for California's Unocal. Similar concerns may affect the rival bids of China and India to buy a Canadian firm with oil fields in Kazakhstan.

Military Implications:

Beneficial environmental restraints and agreements in many regions of the world are likely to be victims of desperation for energy at this time in history when many forces are converging to harm human society. Nations near the edge of environmental and food sufficiency collapse could become additional failed states and competitors. The world's current and rising dependence on oil and gas may possibly trigger new regulations at national, regional, and international levels to protect national energy sources and avoid eventual unethical deals that might jeopardize international security. In addition to possible security aspects that would have direct implications for it, the military should enhance its efforts on energy conservation and development of alternative energy sources—both for its own interest and as a contribution to national security. Security is just one more reason (in addition to climate change and others) why reducing reliance on oil has become vital.

Source:

New rules in global rivalry for oil

The growing Asian demand for energy could alter US strategy.

By Mark Trumbull | Staff writer of The Christian Science Monitor

<http://www.csmonitor.com/2005/0804/p01s04-wogi.html>

Giving China a bloody nose. The Economist, Aug 4th 2005

http://www.economist.com/research/articlesBySubject/displayStory.cfm?story_id=4254062&subjectID=381586&fsrc=nwl&emailauth=%2527%252E%252573P%252CSK%25231%252A%2520%250A (by subscription only; full text in the [Appendix](#))

China Rationing Gasoline And Diesel Fuel

<http://www.terraviva.com/news/china-05zzzzzo.html>

China and India Vie for Company With Oil Fields in Kazakhstan

By Keith Bradsher, NY Times, August 16, 2005

<http://www.nytimes.com/2005/08/16/business/worldbusiness/16oil.html?pagewanted=all&oref=login> (by subscription only; full text in the [Appendix](#))

Item 2. Soviet-Era Anti-plague Institutes Still Pose Environmental Threat

The United States has an extensive program aimed at minimizing the possible transfer and misuse of Soviet WMD R&D. One area that has fallen through the proverbial crack, however, is the collection of more than 80 anti-plague institutes, which were not a formal part of the Russian

biowarfare program and therefore are not covered by the DOD Threat Reduction effort. These establishments, located in all parts of the FSU, still work with extremely hazardous pathogens under totally inadequate physical and biological security. This incredibly dangerous situation is described in a draft report from a major investigation by scholars from the Center for Nonproliferation Studies at the Monterey Institute of International Studies.

Military Implications

The military should take immediate steps to cooperate with these institutions and with other organizations to extend the threat reduction effort to this overlooked sector. A number of these sites are located in Central Asia, an area of great current strategic concern, and any incidents there, or even in Russia itself, would undoubtedly find the US military called on for assistance. It is important that CBW forces become familiar with these facilities and offer help in arranging for their proper secure operation.

Source:

Soviet Germ Factories Pose New Threat

By Joby Warrick, Washington Post, August 20, 2005; A01

<http://www.washingtonpost.com/wp-dyn/content/article/2005/08/19/AR2005081901507.html>

(by subscription only; full text in the [Appendix](#))

Item 3. EU and Japan Respond to Risks from Low Dose Chemicals

A series of articles by Peter Waldman in the Wall Street Journal have brought to attention new scientific studies which have indicated that exposure to extremely low levels of certain industrial chemicals, even a few parts per trillion, can have harmful biological effects. Many of these results are controversial, and disputed by manufacturers and users. Compounds include bisphenol A, phthalates, and perchlorates. The EU and Japan are taking measures to impose stricter controls or outright prohibitions on such materials, and are conducting further investigations.

Military Implications

Because of the extensive use of these chemicals in all sorts of materiel, the military should closely follow both these researches and their consequences. It is possible that the work described will result in changes to prescribed allowable levels in regulations and agreements, including prohibition of the use of some compounds.

Sources:

Wall St. Journal series: "levels of risk"

<http://familiesagainstcancer.org/?id=229>

Direct source (by subscription only): A Little Dab'll Do Ya In

Micro-exposure to common chemicals may cause big health problems

http://users1.wsj.com/lmda/do/checkLogin?a=t&d=wsj&sd=users1&url=http%3A%2F%2Fonlin.e.wsj.com%2Farticle_print%2F0%2C%2CSB112224731634594459%2C00.html (by

subscription only)

Item 4. ASEAN Seeks East Asia's Cooperation on Environmental Issues

Senior environmental officials from ASEAN countries, Japan, China, and South Korea met in Malaysia's Penang state to discuss ways to improve regional cooperation and responses to ecological/environmental problems, such as the recent forest fires. Details of future cooperation, which are also expected to cover issues such as climate change and safeguarding biological diversity, will be discussed at a meeting to be held next month in Jakarta.

Military Implications:

Since one of the outcomes of the meeting was a determination to share experience with environmental problems and look at the use of technology to treat them, US military environmental security personnel should contact each of the parties (the 10 ASEAN countries, and the three East Asian states) and offer to share knowledge and experience in the role of military institutions in environmental security, within the framework of this regional collaboration. This action could open possibilities for useful military-to-military cooperation.

Source:

SE Asia Seeks Cooperation with China, Japan, South Korea on Environmental Protection
Associated Press, August 19, 2005

<http://www.enn.com/today.html?id=8560>

Forest fires for commercial land clearing should stop

<http://www.fao.org/newsroom/en/news/2005/107399/index.html>

Smoky Haze Chokes Southeast Asia

<http://www.ens-newswire.com/ens/aug2005/2005-08-16-06.asp>

Item 5. Taiwan Cracking Down on Environmental Violators

The prevalence of illegal toxic waste dumping has led Taiwan's Environmental Protection Agency to recruit a group of 70 volunteers to patrol industrial areas and report violations of the country's strict waste disposal and recycling rules. The effort is supported by emerging environmental activism among the populace at large.

Military Implications

In order to comply with the law and avoid incidents that would damage the perception of the US, military organizations responsible for projects in Taiwan could take immediate steps (possibly through the Technical Liaison Section of the American Institute in Taiwan) to ensure that their contractors and sub-contractors on the island are scrupulously following the environmental regulations.

Source:

Taiwan's Enviro-Spies

By Matt Kovac, *The Christian Science Monitor*

<http://www.cbsnews.com/stories/2005/08/24/tech/main792375.shtml>

Item 6. India to Set Up Military Surveillance and Reconnaissance System by 2007

Indian Defence Minister Pranab Mukherjee recently declared that India's satellite-based Military Surveillance and Reconnaissance (SBS) System that was supposed to be operational this year, is now in an advanced stage of development and will begin functioning by 2007.

Military Implications:

Although the satellite-based surveillance system is originally dedicated exclusively to military-related matters, India might consider extending its use to environment-related issues. Relevant military personnel and satellite specialists might consider eventually assisting India with extending the use of the system to cover a larger range of applications.

Sources:

India installs Satellite surveillance system

<http://news.indiainfo.com/2005/08/04/0408satellite-surveillance.html>

India To Set Up Military SBS System By 2007

<http://www.spacewar.com/news/india-05zq.html>

Item 7. UN Envisaging a Treaty for Multinational Corporations

The UN began a feasibility study and eventual steps for the implementation of an international treaty regulating multinational corporations' activities. One of those closely involved in the process is Harvard professor John Gerard Ruggie, appointed by Secretary-General Kofi Annan as his special representative on the issue of human rights and transnational corporations. The special representative position was created for identification and clarification of "standards of corporate responsibility and accountability for transnational corporations and other business enterprises with regard to human rights." STRATFOR (Strategic Forecasting, Inc.) comments that the "appointment is important because it will galvanize a global social movement, which will in turn accelerate the changing systems of public policy development." It might take five years until a draft treaty will be drawn.

Military Implications:

Since the proposed treaty already gained support from many NGOs and activist groups, including environmental ones, it is likely that in a few years multinational corporations will have to comply with stricter environmental and social regulations. The military and its contractors should monitor the evolution of each treaty's preparation in order to be ready to participate in negotiations and act in accordance with any eventual new rules. It is also to be expected that, having had specific rules imposed on them, multinational corporations will exercise pressure at national and international levels, requesting that all corporations abide by the same rules.

Source:

Multinational Business and New Policymaking Venues

By Bart Mongoven, Stratfor Strategic Forecasting, August 04 2005

http://www.stratfor.com/products/enhanced/read_article.php?id=253123&ref=050804 (by subscription only; contact STRATFOR for access)

Item 8. Technological Breakthroughs with Environmental Security Implications

8.1 Piggybacking Environmental Sensors on Communications Gear

Computer science graduate student R.J. Honicky and Prof. Richard Newton of the Univ. of California at Berkeley are working on inexpensive environmental sensors that can be incorporated into communications devices like cell phones, using the power, location (e.g. GPS), and communications facilities already present in those devices. This technique would greatly reduce the space and cost burden of providing environmental data coverage over a wide area.

Military Implications:

The use of environmental sensors in communication devices could considerably enhance environmental monitoring for improved environmental security and law enforcement, as well as operational environment monitoring. Military applications could range from easier integration of environmental data (e.g. the presence of CBW) into the structure of network-centric warfare, to enhanced environmental monitoring during and after conflict (no need for separate environmental-sensing units, as the sensors could be part of regular communications devices.)

Source:

Saving the World with Cell Phones

By Rachel Metz, Wired.com, August 11, 2005

<http://www.wired.com/news/wireless/0,1382,68485,00.html>

8.2 Micro-reactors Challenge Chemical Weapons Convention Effectiveness

A paper by Tuan Nguyen of the Lawrence Livermore National Laboratory calls attention to the erosion in effectiveness of the Chemical Weapons Convention caused by the advent of micro-reactors in the chemical industry. These devices, with sizes from a credit card to a notebook, replace large batch reaction vessels and make it much more difficult to monitor and verify compliance with the Chemical Weapons Convention. Hydrogen cyanide, phosgene, and methyl isocyanate have already been produced using this system, according to Nguyen. He also points out that chemical weapon precursors could be synthesized rather than purchased, making it more difficult to track down and discover the preparation of chemical weapons.

Military Implications:

The military should collaborate with the Organization for the Prohibition of Chemical Weapons to assess the threats that these new techniques might pose and to work out ways of countering their dangers. It should also offer assistance to other countries in the effort to prevent non-state actors from using them for malicious purposes, and encourage those countries to fully implement UN Security Council Resolution 1540 on non-proliferation of weapons of mass destruction, which calls on nations to adopt legislation to criminalize WMD proliferation activities and to develop and implement appropriate, effective export controls.

Source:

Technological advances could reduce effectiveness of Chemical Weapons Convention

http://www.llnl.gov/pao/news/news_releases/2005/NR-05-08-04.html

8.3 Urine-powered Battery

Ki Bang Lee and a team of researchers at Singapore's Institute of Bioengineering and Nanotechnology have developed a very inexpensive and miniaturized power source suitable for biochips used for healthcare testing and disease detection, as in a BW situation. The battery is formed by soaking a credit-card-sized piece of paper in copper chloride, sandwiching it between strips of magnesium and copper, and laminating it between transparent plastic films. When the paper is moistened with a drop of urine, the device generates 1.5 volts of electricity.

Military Implications:

Considering its advantages in size, weight, and convenience, the military should follow this development as it becomes suitable for commercialization, and consider applying it to environmental and health-sensing devices designed for individual use.

Source:

Scientists develop pee-powered battery

By Bjorn Carey, LiveScience, Aug. 16, 2005

<http://msnbc.msn.com/id/8973626/>

8.4 Laser-tracked Honeybees Detect Landmines

Joseph A. Shaw at Montana State University and colleagues have developed an improved landmine detection system which first trained honeybees to sniff out explosive fumes leaking from buried landmines, and then tracks them with polarized laser scanning beams. The accuracy is better than 97% at a distance of 83 m, and there is no danger of setting off the landmines.

Military Implications:

The military should evaluate this technique for a variety of minefields cleanup situations.

Source:

Lasers, landmines and honeybees

Ed Gerstner, Nature Physics On-line, 4 Aug 2005

<http://www.nature.com/nphys/journal/vaop/nprelaunch/full/nphys103.html>

8.5 New Efficient Energy-free Technique for Oil Removal from Water

The Extended Gravity Oil Water Separation (EGOWS) concept developed by an engineering team from the University of New South Wales is an improvement on the industry-standard American Petroleum Institute (API) gravity separator that has been widely used for the last 60 years. The device is a simple tank-and-siphon system, entirely mechanical, that operates unattended and purifies water to oil content less than 10 ppm, the level often set by environmental regulations. A simple, innovative application of hydraulic principles results in residence times of days instead of minutes, as is common with API designs. Utility seems be limited to sources with episodic discharges, rather than steady flows.

Military Implications:

The military should investigate the use of this system (being promoted by New South Innovations, the commercial arm of the University) in situations where episodic oil discharges can contaminate water sources.

Source:

New approach to oil-water separation

<http://www.engineeringtalk.com/news/uns/uns100.html>

Item 9. Updates on Previously Identified Issues**9.1 Recycling Regulations in the EU****9.1.1 E-waste Management Directive Came into Effect on August 13, 2005**

The EC directive for e-waste management, Waste Electronic and Electrical Equipment (WEEE), has come into effect, requiring that all 25 EU member states comply with the electrical and electronic appliances disposal framework in order to minimize the impacts of this kind of waste on the environment. Among other stipulations, the directive requires that all such devices manufactured in the EU bear a label requiring mandatory recycling. The related directive on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment was also updated, setting maximum concentration values for some substances that were previously supposed to be completely banned in manufacture after July 1, 2006: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE). [See also *Two E-waste laws entered into force in the European Union* of February 2003, and *E-waste Directives to be Enforced in the UK* of July 2005 environmental security reports.]

9.1.2 Higher Targets for Packaging Recycling and Recovery

The EU updated and strengthened its 1994 Directive for packaging waste, setting higher recycling and recovery targets to further reduce the negative environmental impacts created by the landfilling and incineration of packaging waste and by the production of virgin materials. This type of waste includes packaging made from paper, glass, metals, plastics and wood.

Military Implications:

Military commands deployed in EU Member States should be prepared to comply with the new directives and consider substitutes for hazardous substances, if not already in place.

Sources:

New recycling law takes effect in the European Union

<http://www.physorg.com/news5795.html>

Commission Decision of 18 August 2005

amending Directive 2002/95/EC of the European Parliament and of the Council for the purpose of establishing the maximum concentration values for certain hazardous substances in electrical and electronic equipment

http://europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2005/l_214/l_21420050819en00650065.pdf

Packaging waste: higher recycling and recovery targets due to be implemented in EU Member States. Reference: IP/05/1057 Date: 18/08/2005

<http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/05/1057&format=HTML&aged=0&language=EN&guiLanguage=en>

9.2 REACH Closer to Finale

The drafting of the Registration, Evaluation and Authorization of Chemicals (REACH) legislation is in its final phases as it moves through committees in the European Parliament. The vote on it is scheduled for November. REACH provides a legal framework for controlling hazardous chemicals, requiring manufacturers and importers to register the physical, chemical and toxicological properties of substances with a central EU database, provide lifecycle safety and environmental risks information, and eventually get a special authorization for those of high concern. Britain, which holds the EU's rotating presidency, hopes that agreement on the program will be reached by the end of the year. [See also *The REACH Program Closer to Entry Into Force* in March 2005, *Leading Cancer Specialists call for REACH Strengthening* in May 2004, and *EU Chemical Policy Reforms* in January 2004 environmental security reports.]

Military Implications:

[Same as in May 2004 report on the same issue] Assessment of the REACH system's latest proposed changes and their impacts on the US Forces in Europe in relation to existing SOFAs and other agreements remains important. As currently proposed, the REACH system still implies the registration of all compounds in use by military forces operating within the EU. If implemented, that could raise security issues, as well as create major record keeping problems.

Source:

Feature - Reaching Balance: Europe Weighs Health Verses Industry

<http://www.planetark.com/dailynewsstory.cfm/newsid/32150/story.htm>

9.3 Climate Change Issues

9.3.1 New Computer Climate Models Reveal Threatening Conditions

New computer climate models reveal Earth's limits of CO₂ intake. The computer climate models developed by scientists from Berkeley Atmospheric Sciences Center, Woods Hole Oceanographic Institution, and the National Center for Atmospheric Research (NCAR) in Boulder, Colorado indicate that CO₂ absorption by land and oceans can not keep up with the current trends of increasing fossil fuel emissions, accelerating climate warming after the critical point is reached. The process is increased by drought and other phenomena already present. The paper explaining the findings, *Evolution of carbon sinks in a changing climate* was published in the Proceedings of the National Academy of Sciences (PNAS) of August 9, 2005.

Another computer model, also developed by scientists at the National Center for Atmospheric Research, simulates Earth's climate at the time of the greatest mass extinction in history, at the end of the Permian Era. It reveals that an abrupt and dramatic rise in atmospheric levels of CO₂ triggered the extinction of an estimated 90-95% of all marine species, and about 70% of all terrestrial species. "The results demonstrate how rapidly rising temperatures in the atmosphere can affect ocean circulation, cutting off oxygen to lower depths and extinguishing most life," says NCAR scientist and lead author, Jeffrey Kiehl.

9.3.2 New observations and climate model data confirm recent warming of tropical atmosphere

Results of state-of-the-art climate models by Lawrence Livermore National Laboratory are consistent with new observational estimates of temperature data obtained from satellites and weather balloons, providing compelling evidence that the tropical troposphere is warming since

1979. Human activity is considered as one important cause of the warming. [See also *New Developments on Climate Change* of January 2005 environmental security report.]

9.3.3 Melting of Permanent Frozen Areas Accelerates

Siberia's melting accelerates global warming. Scientists recently discovered that in the last three or four years the entire western Siberian sub-Arctic region has begun melting, transforming the world's largest frozen peat bog into a watery landscape of lakes. This could cause the release into the atmosphere of huge quantities of methane, 20 times as potent a greenhouse gas as carbon dioxide. Consequently, *Siberia's* melting, considered to be partially caused by global warming, becomes in its turn an accelerating factor of it. This finding follows a similar phenomenon of major expansion of lakes in Alaska's northern extreme, bordering the Arctic Ocean.

The *Arctic Ocean* could be seasonally ice-free within 100 years, concludes a new report by U.S. and Canadian scientists. Climate warming is causing thawing of Arctic glaciers and ice sheets, driving the Arctic system into an ice-free state for the first time in more than one million years. The researchers could find no natural processes that might slow or reverse the accelerating melting process. Indigenous people and animals of Alaska, Canada, Russia, Siberia, Scandinavia and Greenland, are already feeling the warming, but the consequences will be felt worldwide, mostly by the millions of people of coastal areas. The melting is an accelerating process. [See also *Climate Change Updates; Antarctic glaciers shrinking accelerating*, in April 2005 environmental security report]

9.3.4 Greenland Conference on Global Warming

Environmental ministers and other officials from 23 countries around the world and the EU met on the edge of a retreating glacier (110 Km in 45 years) in Greenland and agreed that nations must take action against global warming. The proceedings of the conference were not made public and although the group didn't make specific action recommendations, there was consensus that discussions need to be urgently replaced by action.

Military Implications:

[Similar to previous on Climate Change-related issues] The new models and discoveries, along with others, represent guidelines and/or warnings of what could happen if the greenhouse gases emissions increase continues. New scientific evidence, grassroots groups, and conscientious governments will amplify the pressure to tackle climate change issues. It is likely that national and regional anti-pollution measures will become more drastic. The military should enhance its efforts to reduce climate-affecting pollution from all sources and all stages of production and use, to comply with potentially tougher regulations and also to set an example.

Sources:

Evolution of carbon sinks in a changing climate

Inez Y. Fung, Scott C. Doney, Keith Lindsay, and Jasmin John

<http://www.pnas.org/cgi/reprint/0504949102v1>

Climate Model Links Warmer Temperatures to Permian Extinction

http://www.nsf.gov/news/news_summ.jsp?cntn_id=104368

New observations and climate model data confirm recent warming of tropical atmosphere

http://www.llnl.gov/pao/news/news_releases/2005/NR-05-08-05.html

Heat and light. An unexplained anomaly in the climate seems to have been the result of bad data
The Economist print edition, Science & Technology, Climate change, Aug 11th 2005

http://www.economist.com/research/articlesBySubject/displayStory.cfm?story_id=4269858&subjectID=348924&fsrc=nwl&emailauth=%2527%25290617L%2527BUQ%2526%255C%250A
(by subscription only; full text in the [Appendix](#))

Climate warning as Siberia melts

From issue 2512 of New Scientist magazine, 11 August 2005, page 12

<http://www.newscientist.com/channel/earth/mg18725124.500> (by subscription only; full text in the [Appendix](#))

Arctic Ocean Could Be Ice-Free in Summer Within 100 Years, Scientists Say

<http://uanews.org/cgi-bin/WebObjects/UANews.woa/9/wa/SRStoryDetails?ArticleID=11532>

Officials at Global Conference Say It's Time to Take Action on Global Warming

By Jan M. Olsen, Associated Press, August 19, 2005

<http://www.enn.com/today.html?id=8564>

9.4 Indian Ocean Tsunami Early Warning System to be Operational by the End of 2005

Further on the efforts to prevent a recurrence of the December 2004 tsunami catastrophe, the Intergovernmental Coordination Group (ICG) for the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) ended its first meeting in Perth, Australia, concluding that the network of 23 stations for real-time sea-level observation covering the whole Indian Ocean basin is expected to be established by the end of 2005. Six stations are already operational. The network is the first element of the system; the other two are an improved seismographic network, and the deployment of deep-sea pressure sensors capable of detecting the tsunami signal as it travels over the deep ocean. The entire system is expected to be fully operational by next July. The next ICG meeting is scheduled for December 12–16, in Hyderabad, India. However, the UN oceanographic body warns that the system will be useless without adequate regional and national emergency and preparedness plans. [See also *Tsunami Triggers an Early Warning System for Indian Ocean and Beyond* in January 2005 environmental security report]

Military Implications:

[Similar to previous months on the same issue] Relevant military logistics personnel should cooperate and make recommendations for national preparedness plans and eventually update previous military plans to support disaster responses for the Indian Ocean basin. If not involved yet, military liaisons with the Department of State and the National Oceanic and Atmospheric Administration (including other government systems linked to NOAA) should consider contributing in the development of the Indian Ocean early warning system and also follow its developments to assure best cooperation in case of necessity.

Sources:

UN-backed Indian Ocean tsunami early warning system begins to take shape

<http://www.un.org/apps/news/story.asp?NewsID=15309&Cr=tsunami&Cr1=>

Simple tsunami alert system now in place - U.N.

<http://www.alertnet.org/thenews/newsdesk/SP103959.htm> (article stored for a limited time on the website; full text in the [Appendix](#))

Interview - Tsunami Warning Useless without Plans, Says UN Body

<http://www.planetark.com/dailynewsstory.cfm/newsid/31918/story.htm>

9.5 Pacific Islands Forum Summit in October

The Pacific Islands Forum Summit will be held on October 27, in Papua New Guinea. It will be preceded by the Small Island States Summit and the Pacific ACP (African Caribbean Pacific) Leaders Summit, and the Pacific leaders' retreat on October 25-26, and followed by a post-forum dialogue meeting on the 28th and 29th. The Forum's topics will include Pacific regional security, aid, policing, peacekeeping, money laundering, arms trading, HIV-AIDS, resource management of commodities and fish stocks, and regionalized governance. It will be attended by the prime ministers of Australia, New Zealand, Fiji, Samoa, Tonga, Cook Islands, PNG, Tuvalu, Vanuatu, Nauru, French Caledonia, and other islands states, as well as representatives of the EU, the UN, United States of America, China and Japan. Parallel with the official forum will be meetings of NGOs representing stakeholder groups and lobbyists. [See also *Asia and Pacific Countries Adopt Declarations on the Environment* of March 2005 environmental security report]

Military Implications:

The Pacific Islands Forum is the association of the 16 independent island states of the Pacific, one of whose four areas of concern is sustainable development and environmental security. Its objective is "to enhance the economic and social well-being of the people of the South Pacific". Its Pacific Plan lays out how the region can improve cooperation in the four areas. In view of the large number of environmental aspects of military operations in the Pacific theater, PACOM should arrange to have observer representation at the Summit, in order to provide input to the discussions and learn of future environmental security plans.

Sources:

NZ Election Postpones Pacific Forum Until October
<http://www.scoop.co.nz/stories/HL0506/S00411.htm>

Pacific Islands Forum: www.forumsec.org.fj

9.6 Iraq's Marshes Recovering

Iraq's Mesopotamian marshes, which almost vanished during Saddam Hussein's rule, are rapidly recovering to their former 1970s state, according to the findings of the Iraqi Marshlands Observation System. The system is the latest component of the UNEP marshlands project based on the use of a variety of environmentally sound technologies and technical training. However, the funding of the project might be in jeopardy for the moment, since Japan has postponed the donors' conference due to the ongoing controversies over Iraq's constitution. The marshes, reputed to be the biblical Garden of Eden, are a major source of fish and freshwater for local people, as well as an important habitat for wildlife. [See also *UN to Help Tackle Iraq Pollution* in September 2004 and *Iraq Marshlands Restorations Could be Dangerous if not Preceded by Cleanup* in October 2003 environmental security reports]

Military Implications:

[Same as in September 2004 report] Although troop limitations preclude direct involvement in the environmental clean-up process, the coalition military forces could provide security to civilian scientists to ensure that research and cleaning efforts are systematic and successful. Some military

and their related civilian environmental personnel could eventually be asked to contribute expertise.

Sources:

UNEP Press Release. Iraqi Marshlands: On the road to recovery

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=449&ArticleID=4902&l=en>

Japan scrubs Iraq marshland donor conference amid constitution negotiations

<http://www.signonsandiego.com/news/world/20050825-0205-iraq-marshlanddonors.html>

Item 10. Reports to Review

10.1 *Fluctuations of Glaciers VIII 1995–2000 Report*

The latest report by the World Glacier Monitoring Service, *Fluctuations of Glaciers (FoG) VIII*, examining glaciers' situation over the period 1995–2000, warns of a possible complete deglaciation due to the greenhouse effect in the next few decades. This would be a phenomenon "without precedent in the history of the Earth" notes the report. The conclusion is based on the direct proportionality observed between the losses of average annual ice thickness and accelerated global warming over the last two decades of the 20th century. The FoGs are published each five years since 1959, offering a comprehensive analysis and standardized information on changes in glaciers' conditions.

Military Implications:

[Similar to previous on the climate change issue] This report, along with others along the same line, increases scientific research and international pressure for stricter controls on greenhouse gas emissions, including stringent national and regional measures, which could affect military training and operations in all theaters. If good scenarios of military implications of climate change have not yet been written, then they should be. The scenarios could be used as an aid to assess specific impacts, inform research and development, and guide procurement of new cost-effective technologies with low greenhouse gas emission.

Sources:

Fluctuations of Glaciers VIII, 1995–2000 report

<http://www.geo.unizh.ch/wgms/fog/fog8.pdf>

‘Fluctuations of Glaciers’ Report Launched

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=449&ArticleID=4896&l=en>

World Glacier Monitoring Service: <http://www.geo.unizh.ch/wgms/>

10.2 UK Defense Ministry released its first Sustainable Development Report

Ministry of Defense of the UK released its first stand-alone report that aims to provide an overview of the Department's work on Sustainable Development issues. MoD's program for the coming years includes improved data collection systems and the continued integration of sustainable development considerations into procurement. MoD intends to produce an interim report for 2004/2005 and a full report each financial year thereafter.

Military Implications:

Relevant military personnel should study the report for possible insights to improve US environmental strategy. Section 7.1: Sustainable Development and Environmental Management in Defense and 7.2: Environmental Protection in Defense could be of particular importance.

Source:

Ministry of Defense Sustainable Development Report October 2003 – October 2004

http://www.mod.uk/linked_files/dsc/env/mod_sd_report_03_04.pdf

APPENDIX

Reference Details

This Appendix contains the full text for the articles that are not available on the Internet or are usually stored for a limited time on the respective Web sites.

Item 1. Increasing Oil Demand in China and India Raise Security Concerns

Giving China a bloody nose

Aug 4th 2005 | HONG KONG AND NEW YORK

From The Economist print edition

http://www.economist.com/research/articlesBySubject/displayStory.cfm?story_id=4254062&subjectID=381586&fsrc=nwl&emailauth=%2527%252E%252573P%252CSK%25231%252A%2520%250A (by subscription only)

By sabotaging a Chinese bid, America has damaged its own interests

WHAT started out as a firecracker—China's biggest, boldest foreign takeover attempt, and a contested one to boot—this week fizzled out as a damp squib. On August 2nd, the China National Offshore Oil Corporation (CNOOC), a huge, partially state-owned firm, meekly withdrew its \$18.5 billion bid for California's Unocal, scared off by what it calls “unprecedented political opposition” on Capitol Hill. On August 10th Unocal shareholders are now almost certain to accept a lower \$17.6 billion offer from a domestic rival, Chevron.

CNOOC emerges from this episode with question marks over its credibility. It bears no fault for the fact that it became a lightning rod for all the issues that now enrage American politicians about China—from its “undervalued” currency and trade surplus with America to its supposed destruction of American jobs and poor human-rights record. It can fairly cast itself as a victim and turn to hunting other, less costly and politically sensitive, oil and gas assets. Relieved investors reacted to the news by sending CNOOC's shares higher.

Even so, CNOOC made some costly tactical errors and lost the lobbying battle in Congress, despite hiring sophisticated advisers. It could have quickly arranged to sell on Unocal's American assets (some 30% of its turnover) to counter claims that the deal threatened American “energy security”. After all, CNOOC was mostly after Unocal's Asian gas reserves.

More critically, having dithered initially—it had the chance to buy Unocal in April, before Chevron entered the fray—CNOOC might have helped its cause by raising its bid by another \$500m or so late last month to counter an increased offer from Chevron. That would have maintained a 10% or so price differential in its favour, probably enough to compensate Unocal's shareholders for the risk of the bid being blocked by politicians and thereby increasing its chances of winning the endorsement of the Unocal board. CNOOC now concedes that “life might have been very different” if it had gone for a killer bid, but says that it decided not to do so in the interests of its own shareholders.

China crisis?

While CNOOC's bid is the most high-profile failure, it is only the latest in a string of misses by Chinese firms trying to buy overseas. Last month white goods group Haier pulled out of its quest to acquire America's Maytag after a bigger American rival, Whirlpool, countered. China Mobile was outbid for Pakistan Telecom by a competitor from the United Arab Emirates. And China Minmetals failed in its \$7 billion offer for Canada's Noranda. Forecasts that Chinese firms are about to buy up the world, the stuff of headlines only weeks ago, now look as naïve as the firms and their inexperienced bosses themselves.

The most worrying aspect of the CNOOC episode, however, is what it says about America. The anti-China hysteria in Washington, DC, the cowardly silence of the pro-China business lobby and the blatant disregard for fair play and open markets is deeply disturbing. A second-rank oil firm such as Unocal is not worth such a sacrifice of principles. Blocking CNOOC has not meaningfully increased America's energy security. But it may have damaged American business interests, in China and elsewhere. How could America now credibly complain about, say, French attempts to prevent PepsiCo taking over Danone? Beijing will no doubt use this incident to deflect American pressure to pursue reform in other areas. American politicians, so fond of seizing the moral high ground, have ceded it to, of all people, the Chinese.

It seems unlikely that CNOOC will now sulk at home just because its plan to buy Unocal has been thwarted. It has significant unused spending power. While a bid for another big American firm would be daft, there are other options. People close to CNOOC say that it has its eye on Woodside, an Australian firm with desirable gas and oil assets. Such a deal might encounter nationalist resistance in Australia too, but it would be a good fit given CNOOC's need for lots of liquefied natural gas.

If CNOOC does buy a small to middling independent energy firm, it would merely be doing what plenty of western rivals have done of late: gobbling up oil and gas assets in a desperate bid to replenish reserves. Some \$63 billion in mergers and acquisitions have been announced already in the oil and gas business this year, nearly as much as in all of 2004.

But one danger is that, feeling shunned by America and nervous of a similar reaction elsewhere, the Chinese may decide to vigorously pursue less savoury options for getting oil and gas. Unlike America and Europe, China does not preach about human rights and democracy to thuggish dictators. On the contrary, China has happily struck deals with countries, such as Myanmar and Sudan, which face American sanctions or international disapproval. It is also rumoured that China has offered arms and other sensitive defence technology in return for oil and gas rights in certain countries, a trade that may seem even more attractive now that America has blocked open-market purchases.

But if China does pursue oil and gas through such “oil diplomacy”, the Western-educated, Wall Street-minded men running CNOOC are unlikely to be in the vanguard. A few weeks ago, the government folded the assets of the China National Petroleum Corporation (CNPC) and its listed affiliate, PetroChina, into a new, as yet unnamed firm. This new entity's express purpose is to be a

“platform for international business development” and to “establish significant overseas operations.” A glance at the forays overseas so far by Chinese energy companies reveals that CNPC/PetroChina is far and away the leader in both the number of deals done and in the value of those deals. Petroleum Intelligence Weekly, a trade journal, puts it well: this new company “could become the acquisition vehicle to watch”.

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China and India Vie for Company With Oil Fields in Kazakhstan

By KEITH BRADSHER, NYTimes, August 16, 2005

<http://www.nytimes.com/2005/08/16/business/worldbusiness/16oil.html?pagewanted=all&oref=login> (by subscription only)

HONG KONG, Tuesday, Aug. 16 - Chinese and Indian state-owned oil companies are trying to buy a Canadian company with oil fields in Kazakhstan, in the most direct competition yet for energy between Asia's most populous countries.

A joint venture of the China National Petroleum Corporation, China's biggest oil company, and PetroChina, its publicly traded subsidiary, offered roughly \$3.2 billion late Monday for PetroKazakhstan, a person close to the negotiations said. The Oil and Natural Gas Corporation, India's main state-owned oil company, has already reportedly submitted a bid of \$3.6 billion in cooperation with the steel maker Mittal Group.

PetroKazakhstan, whose shares are traded in Toronto, issued a statement from its headquarters in Calgary, Alberta, after the close of trading that it had received proposals to acquire the entire company. The company announced in late June that it had been approached by suitors, and investment bankers had identified the China National Petroleum Corporation and the Oil and Natural Gas Corporation as being interested.

While the Chinese bid appeared to be lower than the Indian bid, Chevron's successful pursuit of Unocal this summer despite a higher bid from Cnooc Ltd. of China has shown that the higher bid does not always win in a politically charged industry like energy.

The China National Petroleum Corporation already has substantial oil investments of its own in Kazakhstan, and has been trying to build a pipeline to carry the oil to China. The Chinese government has been actively courting Kazakhstan as well, partly because Beijing officials want to make sure that no Muslim insurgency develops in heavily Muslim areas of Xinjiang Province near the Kazakh border.

PetroKazakhstan has been locked in bitter disputes with the Kazakh government over its flaring of natural gas and other issues, disputes that China's alliance with Kazakhstan might be able to smooth over.

An Indian buyer of PetroKazakhstan would face a more difficult challenge in exporting oil from Kazakhstan, which does not share a border with India. Oil experts said that an Indian buyer might

need to export the oil through Russia, further increasing Kazakhstan's dependence on Russia at a time when Kazakhstan, a former Soviet republic, has been trying to develop a broader array of international relationships.

"That's probably behind the cheaper bid from the Chinese," said Sam Dale, an oil industry expert in Singapore with Energy Intelligence, a New York-based newsletter publishing group.

The rival attempts to buy PetroKazakhstan underline the inherent competition between China and India for oil, even though both countries' senior officials have called repeatedly this year for cooperation.

The two countries together hold 37 percent of the world's population. India's oil imports rose 11 percent last year while China's soared 33 percent, although part of China's increase last year reflected stockpiling, and the pace of Chinese imports has started to slow this year.

Western oil executives have complained that they may find it hard to buy oil fields at commercially viable prices if bidding soars because of the involvement of state-owned oil companies that may be driven by military and strategic objectives as well as a need for profits.

Item 2. Soviet-Era Anti-plague Institutes Still Pose Environmental Threat

Soviet Germ Factories Pose New Threat

Once Mined for Pathogens in Bioweapons Program, Labs Lack Security

By Joby Warrick, Washington Post Staff Writer, Saturday, August 20, 2005; A01

<http://www.washingtonpost.com/wp-dyn/content/article/2005/08/19/AR2005081901507.html>

(by subscription only)

ODESSA, Ukraine -- For 50 years under Soviet rule, nearly everything about the Odessa Antiplague Station was a state secret, down to the names of the deadly microbes its white-coated workers collected and stored in a pair of ordinary freezers.

Cloistered in a squat, gray building at the tip of a rusting shipping dock, the station's biologists churned out reports on grave illnesses that were mentioned only in code. Anthrax was Disease No. 123, and plague, which killed thousands here in the 19th century, was No. 127. Each year, researchers added new specimens to their frozen collection and shared test results with sister institutes along a network controlled by Moscow.

Today, the Soviets are gone but the lab is still here, in this Black Sea port notorious for its criminal gangs and black markets. It is just one of more than 80 similar "antiplague" labs scattered across the former Soviet Union, from the turbulent Caucasus to Central Asian republics that share borders with Iran and Afghanistan. Each is a repository of knowledge, equipment and lethal pathogens that weapons experts have said could be useful to bioterrorists.

After decades of operating in the shadows, the labs are beginning to shed light on another secret: How the Soviet military co-opted obscure civilian institutes into a powerful biological warfare program that built weapons for spreading plague and anthrax spores. As they ramped up preparations for germ warfare in the 1970s and 1980s, Soviet generals mined the labs for raw

materials, including highly lethal strains of viruses and bacteria that were intended for use in bombs and missiles.

The facilities' hidden role is described in a draft report of a major investigation by scholars from the Center for Nonproliferation Studies at the Monterey Institute of International Studies. The main conclusions of the report, which was provided to The Washington Post, were echoed in interviews with current and former U.S. officials familiar with the labs. Most scientists who worked in antiplague stations in Soviet times knew nothing of their contributions to the weapons program, the report says.

The labs today are seeking to fill a critical role in preventing epidemics in regions where medical services and sanitation have deteriorated since Soviet times. But an equally pressing challenge is security: How to prevent the germ collections and biological know-how from being sold or stolen. "They often have culture collections of pathogens that lack biosecurity, and they employ people who are well-versed in investigating and handling deadly pathogens," said Raymond A. Zilinskas, a bioweapons expert and coauthor of the draft report on the antiplague system. "Some are located at sites accessible to terrorist groups and criminal groups. The potential is that terrorists and criminals would have little problem acquiring the resources that reside in these facilities."

Managers of the old antiplague stations are aware of their vulnerabilities but lack the most basic resources for dealing with them, according to the Monterey authors and U.S. officials. Since the collapse of the Soviet Union in 1991, budgets at the institutes have fallen so steeply that even the simplest security upgrades are out of reach. One facility in a Central Asian capital could not even afford a telephone and had no way of contacting police in the event of a break-in. At least two antiplague centers outside Russia have acknowledged burglaries or break-ins within the past three years, though there are no confirmed reports of stolen pathogens or missing lab equipment, Monterey officials said.

The lack of modern biosafety equipment is also raising concern among U.S. officials about the potential for an accidental release of deadly bacteria and viruses. In Odessa, where 44 scientists and about 140 support staff carry out research in the I.I. Mechnikov Antiplague Scientific and Research Institute, scientists wearing cotton smocks and surgical masks work with lethal microbes that in the West would be locked away in high-containment laboratories and handled only by scientists in spacesuits.

The lab's scientists said their training in handling dangerous materials allowed them to work safely with pathogens without Western-style safety equipment -- which they viewed as unnecessary and which in any case they cannot afford.

"Many of the institutes are located in downtown areas, and some work with pathogens with windows wide open," said Sonia Ben Ouagrham, who coauthored the Monterey study with Zilinskas and Alexander Melikishvili.

The obscurity of the antiplague stations is hampering their ability to fix the problems, the researchers said. The institutes were not officially part of the Soviet bioweapons complex, so they have been deemed ineligible for the tens of millions of dollars in aid given each year by U.S. and Western governments to keep former weapons scientists from selling their expertise.

Western governments are just beginning to look for ways to help the institutes, and not only because of the bioterrorism threat. In a two-year study of Russia's biotech industry, a panel of the U.S. National Academy of Sciences recently urged former Soviet republics to modernize the antiplague labs and integrate them with other global networks that seek to prevent outbreaks of diseases from becoming pandemics. "The Russian Anti-plague System, regardless of any involvement it might have had in the former offensive program, serves an important public health

need," said David Franz, panel chairman and director of Kansas State University's National Agricultural Biosecurity Center.

Any weakening of the antiplague network has consequences for the control of infectious diseases throughout the world, and especially in Europe, said Monterey's Zilinskas.

"These institutes have served to prevent diseases such as plague, tularemia and Crimean-Congo fever from spilling over," he said, referring to a flulike fever sometimes referred to as "rabbit flu" and a hemorrhagic viral fever. "Some Europeans are unaware of this biological threat on their southeastern flank. Others are aware, but so far, are choosing not to be engaged."

Growth of a Secret Soviet System

The name "antiplague" reflects a grim reality of the Czarist and early Soviet periods, when the first antiplague stations were created: Plague, or black death, was a frequent visitor to Russia and neighboring countries well into the 20th Century.

Plague is caused by a bacterium, *Yersinia pestis*, and it is most commonly transmitted to people by animal or insect carriers, such as rats. It is the same illness that killed an estimated one-third of the population of Europe in the 14th century. Today, plague is easily treated with antibiotics, although a rare form of the disease -- pneumonic plague, caused by breathing the bacteria into the lungs -- is highly lethal and is considered a weapon of choice for germ warfare or bioterrorism.

In Odessa alone, a sea port of just over 1 million people, tourists can visit eight different cemeteries for plague victims, including Plague Mountain, a grassy mound that served as a mass grave for victims of an 1812 outbreak that killed more than 2,600 people.

The first antiplague stations were established to help contain such outbreaks. A dozen of them already were operating by the end of the reign of the last czar. The start of the Soviet era in 1917 brought many new institutes, new priorities and an expanded list of diseases, including tularemia, cholera and anthrax.

The Monterey Institute's report studies how the institutes evolved under Soviet leadership, and draws on scores of interviews and visits to more than 40 antiplague institutes and field stations. Some details emerged previously from the writings and testimony of Soviet weapons scientists. By all accounts, the antiplague network grew dramatically under the Soviets, both in size and sophistication. By the end of the Soviet period it boasted 14,000 employees and 88 permanent facilities, including six major antiplague institutes, 26 regional stations and 53 smaller field stations.

Odessa's facility was a regional station, first opened in 1937 to battle recurring outbreaks of plague linked to infected rats that were arriving by ship. The original building on a municipal dock was later exchanged for a walled compound of three-story buildings painted pale blue. Inside, scientists dissected infected rats and birds in separate virology and bacteriology labs, using equipment that would be considered outmoded in many U.S. high schools today. For years, until the lab purchased autoclaves for cremating contaminated materials, the bodies of the diseased animals were simply buried in the lab's courtyard.

Beginning in the 1950s, the Soviet military began to exert influence over research priorities in the facilities. At first, the Monterey report says, antiplague institutes were asked to help bolster the nation's defenses against a possible foreign biological attack. The assignment was code-named "Problem Five," and it required scientists to expand on their already-proven ability to respond to a sudden outbreak. Researchers refined techniques for detecting and identifying pathogens, established rapid-response teams and aided the investigation of new drugs.

A growing international consensus against biological warfare prompted the Soviets to shift to a new direction. In 1969, President Richard M. Nixon unilaterally halted U.S. production of

biological weapons. Three years later, the Soviet Union joined the United States and other nations in signing the Biological Weapons Convention, outlawing biological weapons. Within the next two years, the Soviets secretly began to build a massive offensive weapons program. Much of it was hidden inside a sprawling civilian-run enterprise called Biopreparat, which put tens of thousands of scientists to work on bioweapons projects disguised as pharmaceutical research. The ruse worked. Western governments did not become fully aware of true of purpose of Biopreparat until a leading Soviet scientist, Vladimir Pasechnik, defected to Britain in 1989.

A Steady Supply of Virulent Strains

When Soviet generals began their expanded buildup of bioweapons in the 1970s, they looked to the antiplague network for help, the Monterey authors said. The largest antiplague institutions were enlisted into a new program, code-named "Problem F," or simply "Ferment."

According to Zilinskas and others, the antiplague institutes were a goldmine for the military because they provided "ready-to-use information, biomaterial and expertise."

Precise details of the antiplague institutes' work remain unclear. The Russian government still refuses to officially acknowledge the existence of the Soviet Union's offensive weapons program. Russia also has outlawed any disclosures of classified information from the pre-1992, Soviet era. But scientists now living outside Russia have brought many key facts to light, the researchers said. It is now known, for example, that key antiplague institutes during this period came under the command of Soviet military officers, some of whom once worked at military biological facilities. It is also clear, they said, that Soviet bioweapon engineers relied on the antiplague institutes for basic research and identification of pathogen strains that were exceptionally lethal.

"There was a secret law that enjoined all antiplague institutes to send the government any kind of virulent strain that might be used for defensive purposes," said Zilinskas. Soviet bioweapons that most likely originated in antiplague centers include bacterial strains that cause plague, anthrax and tularemia, the report concludes. In addition, it is believed that one of the antiplague facilities, in Volgograd, helped Biopreparat scientists develop weaponized versions of the bacteria that cause glanders and melioidosis, two livestock diseases that also attack humans. "This collaboration probably went beyond the mere supplying of strains," the authors write. "It included efforts to weaponize wild bacterial strains."

The bioweapons program was so secret that many researchers didn't know about it. Lev Mogilevsky, deputy director of the Odessa research facility and a 36-year veteran of the antiplague system, said he believed it was impossible that his institute could have contributed to the creation of offensive biological weapons. But he did remember working on joint projects with military medical units in the 1970s and '80s, during which the exchange of information was decidedly one-way.

"We would hold meetings to discuss Problem Five, and there would be many institutes participating, including military ones," Mogilevsky recalled. "Our contributions would be open, but the military's never were. They revealed nothing."

Under-funded, Under-staffed and Unsecured

Today, the Odessa antiplague station and others like it throughout the former Soviet Union face a new generation of difficulties. Even the simple task of gathering field specimens can be a challenge, because it requires travel. That means using the institute's aging van, which is often in need of repairs, and purchasing gasoline, which the lab cannot afford.

To grow bacteria for testing, the scientists need a sterile nutrient broth, or growth medium, common to biological labs all over the world. But again, the Odessa lab has no money for such

supplies. Workers improvise by collecting meat scraps, boiling them down in the lab and skimming off the fat.

The list goes on: Glassware. Lab chemicals. Fax paper. Microscope parts. Testing kits.

"Our budget has been very much decreased. The equipment that we have is old," said Mogilevsky.

"Basically what we have is enough to sustain the lab at a very low level of activity."

Other shortages, unrelated to lab work, trouble the institute's deputy director. He worries about broken alarm sensors, ancient locks that need replacing and walls that should be built higher and stronger to keep out intruders. He wonders whether a single guard is enough, and if not, how he could possibly afford another.

When the Monterey Institute and the Nuclear Threat Initiative, a nonprofit group, brought scores of antiplague scientists together two years ago for their first post-Soviet-era meeting, complaints about inadequate supplies and plummeting budgets were a common refrain. In fact, Odessa's plight was nowhere near the worst.

"All were in poor shape," said Zilinskas, who has helped launch a program that brings antiplague scientists to the United States for training. "Some of the facilities received literally no money from their governments, at all."

Many of the centers in the ex-Soviet republics continue to maintain high professional standards, the researchers said, thanks in part to a core of older scientists who were trained under the Soviet system in classic laboratory techniques. But today, training is harder to come by, even for the few young scientists who are willing to accept starting salaries of less than \$25 a week.

Over time, continued cost-cutting inevitably will undermine the labs' ability to function at all. And that, the researchers said, has a cost of its own.

"If the system shuts down because of lack of equipment and funding, there's a risk of an epizootic outbreak among animals that becomes an outbreak among humans," said Monterey's Ouagrham.

"And humans travel."

Item 9. Updates on Previously Identified Issues

9.3 Climate Change Issues

Heat and light

An unexplained anomaly in the climate seems to have been the result of bad data

The Economist print edition, Science & Technology, Climate change, Aug 11th 2005

http://www.economist.com/research/articlesBySubject/displayStory.cfm?story_id=4269858&subjectID=348924&fsrc=nwl&emailauth=%2527%25290617L%2527BUQ%2526%255C%250A

(by subscription only)

CLIMATOLOGY is an inexact science at the best of times. Unfortunately it has become, over the past couple of decades, a politically charged one as well. As the debate about global warming—and what, if anything, to do about it—has gathered pace, uncertainties in the data that would be of merely academic interest in other disciplines have acquired enormous practical significance. And one of the most curious uncertainties of all is the apparent discrepancy between what is happening to temperatures at the Earth's surface and what is happening in the troposphere—the lowest layer of the atmosphere, and thus the part that is in contact with that surface.

The troposphere is where most of the air is found and where most of the weather occurs. Computer models predict that, if global warming is really happening, temperatures in the troposphere should rise along with those on the surface. Recorded surface temperatures are, indeed, rising. However, both data from weather balloons and observations made by satellites suggest that temperatures in the troposphere have remained constant since the 1970s. Over the tropics they may even have dropped. This counter-intuitive result has caused sceptics to question how much warming, if any, is actually going on.

There are, of course, three possibilities. One is that the sceptics are right. A second is that the models are wrong. And the third is that there is something wrong with the data. Three papers published in this week's issue of *Science* suggest that the third possibility is the correct one.

Day and night

The first of these studies, conducted by Steven Sherwood of Yale University and his colleagues, examined data from weather balloons. For the past 40 years, weather stations around the world have released these balloons twice a day at the same time—midday and midnight Greenwich Mean Time. Each balloon carries a small, expendable measuring device called a radiosonde that sends back information on atmospheric pressure, humidity and, most importantly for this study, temperature.

Unfortunately, data from radiosondes come with built-in inaccuracies. For example, their thermometers, which are supposed to be measuring the temperature of the air itself (that is, the temperature in the shade) are often exposed to, and thus heated by, the sun's rays. To compensate for this, a correction factor is routinely applied to the raw data. The question is, is that correction factor correct?

Dr Sherwood argues that it is not. In particular, changes in radiosonde design intended to reduce the original problem of over-heating have not always been accommodated by reductions in the correction factors for more recently collected data. Those data have thus been over-corrected, reducing the apparent temperature below the actual temperature.

Dr Sherwood and his colleagues hit on a ruse to test this idea. Because weather stations around the world release their balloons simultaneously, some of the measurements are taken in daylight and some in darkness. By comparing the raw data, the team was able to identify a trend: recorded night-time temperatures in the troposphere (night being the ultimate form of shade) have indeed risen. It is only daytime temperatures that seem to have dropped. Previous work, which has concentrated on average values, failed to highlight this distinction, which seems to have been caused by over-correction of the daytime figures. When the team corrected the erroneous corrections, the result agreed with the models of the troposphere and with records of the surface temperature. The improvement was particularly noticeable in the tropics, an area that had previously appeared to have high surface temperatures but far cooler tropospheric temperatures than had been expected.

The second piece of work looked at satellite measurements of tropospheric temperatures. For the past two decades, microwave detectors, placed on a series of satellites flying in orbits that take them over both poles, have been used to calculate the troposphere's temperature. (Microwaves radiated from the atmosphere contain a host of information about its temperature and humidity.) Here, too, the data are problematic. Because the satellites are looking down through the whole atmosphere, measuring the temperature of the troposphere requires subtracting the effects of the stratosphere—the atmospheric layer above it. But when this has been done, the result suggests, like the over-corrected data from the radiosondes, that the troposphere is cooling down relative to the surface.

However, Carl Mears and Frank Wentz of Remote Sensing Systems, a firm based in Santa Rosa, California, think that this trend, too, is an artefact. It is caused, they believe, because the orbital period of a satellite changes slowly over that satellite's lifetime, as its orbit decays due to friction with the outer reaches of the atmosphere. If due allowance is not made for such changes, spurious long-term trends can appear in the data. Dr Mears and Dr Wentz plugged this observation into a model, and the model suggested that the apparent cooling the satellites had observed is indeed such a spurious trend. Correct for orbital decay and you see not cooling, but warming.

The third paper, by Ben Santer of the Lawrence Livermore National Laboratory in California and his colleagues, argues that it is, indeed, errors in the data that are to blame for disagreements between the predictions of computer models about how the troposphere should behave and what the weather balloons and satellites actually detect. Dr Santer's team compared 19 different computer models. All agreed that the troposphere should be getting warmer. Individual models have their individual faults, of course. But unless all contain some huge, false underlying assumption that is invisible to the world's climatologists, the fact that all of them trend in the same direction reinforces the idea that it is the data which are spurious rather than the models' predictions.

It is, nevertheless, doubtful that these papers will end the matter. Studying the climate is a hard problem for three reasons. The system itself is incredibly complex. There is only one such system, so comparative studies are impossible. And controlled experiments are equally impossible. So there will always be uncertainty and therefore room for dissent. How policymakers treat that dissent is a political question, not a scientific one.

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Climate warning as Siberia melts

From issue 2512 of New Scientist magazine, 11 August 2005, page 12

<http://www.newscientist.com/channel/earth/mg18725124.500> (by subscription only)

THE world's largest frozen peat bog is melting. An area stretching for a million square kilometres across the permafrost of western Siberia is turning into a mass of shallow lakes as the ground melts, according to Russian researchers just back from the region.

The sudden melting of a bog the size of France and Germany combined could unleash billions of tonnes of methane, a potent greenhouse gas, into the atmosphere.

The news of the dramatic transformation of one of the world's least visited landscapes comes from Sergei Kirpotin, a botanist at Tomsk State University, Russia, and Judith Marquand at the University of Oxford.

Kirpotin describes an "ecological landslide that is probably irreversible and is undoubtedly connected to climatic warming". He says that the entire western Siberian sub-Arctic region has begun to melt, and this "has all happened in the last three or four years".

What was until recently a featureless expanse of frozen peat is turning into a watery landscape of lakes, some more than a kilometre across. Kirpotin suspects that some unknown critical threshold has been crossed, triggering the melting.

Western Siberia has warmed faster than almost anywhere else on the planet, with an increase in average temperatures of some 3 °C in the last 40 years. The warming is believed to be a combination of man-made climate change, a cyclical change in atmospheric circulation known as the Arctic oscillation, plus feedbacks caused by melting ice, which exposes bare ground and ocean. These absorb more solar heat than white ice and snow.

Similar warming has also been taking place in Alaska: earlier this summer Jon Pelletier of the University of Arizona in Tucson reported a major expansion of lakes on the North Slope fringing the Arctic Ocean.

The findings from western Siberia follow a report two months ago that thousands of lakes in eastern Siberia have disappeared in the last 30 years, also because of climate change (New Scientist, 11 June, p 16). This apparent contradiction arises because the two events represent opposite end of the same process, known as thermokarsk.

In this process, rising air temperatures first create "frost-heave", which turns the flat permafrost into a series of hollows and hummocks known as salsas. Then as the permafrost begins to melt, water collects on the surface, forming ponds that are prevented from draining away by the frozen bog beneath. The ponds coalesce into ever larger lakes until, finally, the last permafrost melts and the lakes drain away underground.

"This is an ecological landslide that is probably irreversible and is undoubtedly connected to climatic warming"

Siberia's peat bogs formed around 11,000 years ago at the end of the last ice age. Since then they have been generating methane, most of which has been trapped within the permafrost, and sometimes deeper in ice-like structures known as clathrates. Larry Smith of the University of California, Los Angeles, estimates that the west Siberian bog alone contains some 70 billion tonnes of methane, a quarter of all the methane stored on the land surface worldwide.

His colleague Karen Frey says if the bogs dry out as they warm, the methane will oxidise and escape into the air as carbon dioxide. But if the bogs remain wet, as is the case in western Siberia today, then the methane will be released straight into the atmosphere. Methane is 20 times as potent a greenhouse gas as carbon dioxide.

In May this year, Katey Walter of the University of Alaska Fairbanks told a meeting in Washington of the Arctic Research Consortium of the US that she had found methane hotspots in eastern Siberia, where the gas was bubbling from thawing permafrost so fast it was preventing the surface from freezing, even in the midst of winter.

An international research partnership known as the Global Carbon Project earlier this year identified melting permafrost as a major source of feedbacks that could accelerate climate change by releasing greenhouse gases into the atmosphere. "Several hundred billion tonnes of carbon could be released," said the project's chief scientist, Pep Canadell of the CSIRO Division of Marine and Atmospheric Research in Canberra, Australia.

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9.4 Indian Ocean Tsunami Early Warning System to be Operational by the End of 2005

Simple tsunami alert system now in place - U.N.

<http://www.alertnet.org/thenews/newsdesk/SP103959.htm>

By Bill Tarrant, Reuters, 04 Aug 2005 07:51:07 GMT

PERTH, Aug 4 (Reuters) - If another big tsunami were to roll across the Indian Ocean today, it would in all likelihood be detected and threatened nations would be alerted, the head of the U.N. body developing such a warning system said on Thursday.

The problem is the system cannot determine whether a tsunami would merely ripple onto sun-spangled beaches of the Indian Ocean rim or turn into monster waves wiping out towns and villages.

"Yes, we can confirm the presence of tsunami today," said Patricio Bernal, executive secretary of the United Nations Education, Science and Culture Organisation's Intergovernmental Oceanographic Commission (IOC), which is spearheading an Indian Ocean tsunami warning system.

Pacific tsunami warning centres in Tokyo and Honolulu now have a network of experts to contact around the clock in Indian Ocean nations when seismographic data indicates an earthquake capable of causing a tsunami.

A string of tidal gauges that the IOC is maintaining off northwestern Sumatra, Diego Garcia and the coast of Mauritius are capable of detecting a tsunami. And Indian Ocean nations are setting up mechanisms to exchange data and warnings.

MINIMISING FALSE ALARMS

What the system can't do is minimise the many false alarms that come with sizeable earthquakes on the seabed that do not trigger a big tsunami or even cause damage on land. That's crucial because emergency coordinators must know when to sound the alarm that will set in motion costly mass evacuation plans.

"It's insufficient, yes," Bernal told Reuters on the margins of the first meeting of the Indian Ocean Tsunami Warning and Mitigation System in the western Australian city of Perth.

"But at least we can confirm it now and that's something we couldn't do even at the end of March," he said.

There were no tsunami warning systems when the strongest earthquake in 40 years struck off the coast of Sumatra on Dec. 26, triggering a record tsunami that is feared to have killed as many as 232,000 people in a dozen Indian Ocean nations and left more than a million homeless.

A second, more expensive system targeted for completion by next July will involve installing a series of pressure gauges on the seabottom that would more accurately -- and far more quickly -- detect the approach and direction of a big tsunami.

Tens of thousands of lives might have been saved if such a system had been in place before the Dec. 26 catastrophe.

"We would have saved all the people in Sri Lanka, India and the Maldives at least, because the wave took two hours to reach there," Bernal said.

REGIONAL WARNING CENTRE

Five countries in the region -- Thailand, India, Indonesia, Australia and Malaysia -- have offered competing proposals to host a regional tsunami warning centre.

Bernal said no decision on that politically sensitive topic would come at the Perth meeting, and he saw no problem having more than one centre anyway.

"It's like the military," one diplomat at the conference said. "You build in redundancy. We'll end up with several nodes, but the thing is to confer with each other."

This week's meeting, which winds up on Friday, will help determine how warnings would be standardised and communicated, how seismic data can be collected and exchanged and how technology can be transferred, among other things.

With tsunami warning systems now in the works for the Mediterranean and the Caribbean regions, the Indian Ocean system could become a global model -- a far cry from seven months ago when few people even knew what a tsunami was, the diplomat said.